

Having thus described the preferred embodiments, the invention is now claimed to be:

1. An apparatus including:
a means (1, 1', 2, 60) for storing, transmitting, or receiving a signal (5, 5') representing user-desired content, the signal including:
the user-desired content (10, 10', 10'', 10''', 62), and
device revocation information (4, 71) embedded in the user-desired content.
2. The apparatus as set forth in claim 1, wherein the means (1, 1', 2, 60) for storing, transmitting, or receiving includes a means (1, 1') for transmitting, and the means (1, 1') for transmitting includes:
a means (18) for generating watermark content (20) associated with the user-desired content, the watermark content (20) including the device revocation information (4).
3. The apparatus as set forth in claim 2, wherein the means (1, 1') for transmitting further includes:
a means (14, 14', 14'', 14''', 16, 24, 26, 44, 44', 44'', 44''') for encoding the user-desired content (10, 10', 10'', 10'''); and
a means (22, 46) for embedding the watermark content (20) into the encoded user-desired content as an embedded watermark.
4. The apparatus as set forth in claim 1, wherein the means (1, 1', 2, 60) for storing, transmitting, or receiving includes a means (2) for receiving, and the means (2) for receiving includes:
a means (32, 34, 36) for reading an embedded watermark (20) included in the signal (5) representing the user-desired content (10), the embedded watermark including the device revocation information (4).
5. The apparatus as set forth in claim 4, wherein the means (2) for receiving further includes:
a means (32, 34, 40) for recovering the user-desired content (10) from the signal (5).

6. The apparatus as set forth in claim 1, wherein the means (1, 1', 2, 60) for storing, transmitting, or receiving includes a means (60) for storing selected from a group consisting of:

an optical disk (60), a magnetic disk, and a non-volatile solid-state memory.

7. The apparatus as set forth in claim 1, wherein the device revocation information (4, 71) is arranged into a plurality of independent revocation sub-lists (74) that are distributed across the user-desired content (10, 10', 10'', 10''', 62).

8. The apparatus as set forth in claim 7, wherein the device revocation information (4, 71) is encoded pervasively through the user-desired content (10, 10', 10'', 10''', 62).

9. The apparatus as set forth in claim 1, wherein the device revocation information (4, 71) is encoded into a watermark (20, 64).

10. The apparatus as set forth in claim 1, wherein the means (1, 1', 2, 60) for storing, transmitting or receiving stores, transmits or receives a signal (5, 5') including the user-desired content arranged in a format selected from a group consisting of: PCM, MPEG, AC3, DST, MLC, ATRAC, DivX, and analog.

11. The apparatus as set forth in claim 1, wherein the user-desired content includes digital video content, and the device revocation information is embedded in the digital video.

12. The apparatus as set forth in claim 1, wherein the means (1, 1', 2, 60) for storing, transmitting, or receiving includes a means (60) for storing which includes a non-volatile storage medium (60) on which the user-desired content (62) is encoded as a selected modulation of a property of the storage medium material, the selected modulation including a first modulation aspect (82) encoding the user-desired content (62) and a second modulation aspect (78) encoding the device revocation information (71).

13. The apparatus as set forth in claim 12, wherein the non-volatile storage medium (60) is an optical disk (60), the selected modulation includes reflective pits formed on or in the optical disk, and the first and second modulation aspects include pit characteristics.

14. The apparatus as set forth in claim 1, wherein the means (1, 1', 2, 60) for storing, transmitting, or receiving includes a means (1) for transmitting which includes:
a framing means (14) for framing the user-desired content (10);
a parameter computing means (16) for computing predictive parameters for each frame;
a means (22) for modifying the predictive parameters to embed the device revocation information (4); and
an encoding means (24) for encoding the frame using the modified predictive parameters.

15. The apparatus as set forth in claim 1, wherein the means (1, 1', 2, 60) for storing, transmitting, or receiving includes a means (2) for receiving which includes:
a parameter extracting means (32, 34) for extracting predictive parameters of a lossless coded frame that encodes the user-desired content (10); and
a means (36) for recovering the device revocation information (4) encoded in the predictive parameters.

16. The apparatus as set forth in claim 1, wherein the user-desired content is a multi-channel audio stream (10', 10'', 10'''), and the means (1, 1', 2, 60) for storing, transmitting, or receiving includes a means (1') for transmitting which includes:
a means (14', 14'', 14''', 44', 44'', 44''') for lossless coding each audio channel; and
a means (46, 48) for combining lossless coded data corresponding to the multiple channels into lossless coded frames, the means for combining embedding the device revocation information (4) into the lossless coded frames.

17. A method for distributing revocation information (4), the method including:
embedding the revocation information (4) into user-desired content (10, 10', 10'', 10''').

18. The method as set forth in claim 17, wherein the embedding includes:
dividing a list of revoked devices into a plurality of sub-lists; and
embedding each sub-list into the user-desired content such that the sub-lists are substantially coextensive with the user-desired content.

19. The method as set forth in claim 17, wherein the embedding includes: generating watermark content (20) including the device revocation information (4); and embedding the watermark content (20) into user-desired content as an embedded watermark.

20. The method as set forth in claim 19, wherein the embedding further includes: encoding the user desired content (10, 10', 10'', 10'''), the watermark content being embedded into the user-desired content during the encoding.

21. The method as set forth in claim 17, wherein the embedding includes: embedding the revocation information (4) pervasively through the user-desired content (10, 10', 10'', 10''').

22. The method as set forth in claim 17, wherein the embedding includes: selecting predictive parameters for encoding the user-desired content (10); modifying the predictive parameters to encode at least a portion of the revocation information (4) in a predetermined manner; and lossless encoding at least a portion of the user-desired content (10) using the modified predictive parameters.

23. The method as set forth in claim 17, wherein the user-desired content is a multi-channel audio stream (10', 10'', 10'''), and the embedding includes: lossless coding each audio channel (10', 10'', 10'''); and combining lossless coded data corresponding to the multiple channels (10', 10'', 10''') into lossless coded frames, the combining also embedding the device revocation information (4) into the lossless coded frames.

24. The method as set forth in claim 17, further including: communicating the user-desired content (10, 10', 10'', 10''') and the embedded revocation information (4) simultaneously.

25. The method as set forth in claim 24, further including:

extracting the revocation information (4) from the communicated user-desired content (10).

26. The method as set forth in claim 25, wherein the extracting includes: extracting an embedded watermark (20) from a received data stream (5); and extracting the device revocation information (4) from the watermark (20).

27. The method as set forth in claim 25, wherein the communicated user-desired content (10) is lossless coded, and the extracting includes:

extracting predictive parameters of a lossless coded frame; and recovering the revocation information (4) encoded in the predictive parameters.

28. The method as set forth in claim 24, wherein the communicating includes: distributing a non-volatile storage medium (60) on which is stored the user-desired content with the embedded revocation information.